

All mere [dictionary "words" have now been excluded from the "Britannica" by Prof. Baynes, who has thus gained a great deal of space for the illustration of more important matter. Those who have an opportunity of comparing the present with former editions will note the advantage of this plan. In the matter of biography great changes will doubtless be introduced, and mere locality will now cease to have an influence in this department; already, we observe that the account of Dr. Adam, an eminent Scotchman of the olden time, has been compressed into a few lines, and a similar plan will doubtless be adopted throughout the work—(though parenthetically let us ask why Aberdour on the Forth, an insignificant watering-place, should have a place, while Aberdour in the north of Aberdeenshire, notable in early Scottish history, and in "the grand old ballad of Sir Patrick Spence," be ignored?) On the other hand, subjects that have become important in our day are discussed at sufficient length, and a fair balance is kept up in the allocation of space. *Adulteration* may be cited as an example of what we mean. The article on that subject has been entrusted to Dr. Letheby, and it very profitably occupies seven times the space formerly allotted to it. The article *Esthetics* has grown from a few lines into an excellent treatise, occupying no less than twelve pages of the new edition. Prof. Huxley has had over twenty pages allotted to his masterly article on *Amphibia*; he also contributes *Actinozoa*. *Agriculture* is discussed at a length suited to its importance; the article is divided into twenty-one chapters, and occupies 125 pages, and it is needless to say that it embraces an account of the latest discoveries and improvements in farming, including descriptions of what has been achieved by steam power. The article on *America* occupies forty-eight pages, and seventeen pages besides have been devoted to a disquisition on *American Literature*, by Prof. Nichol, of Glasgow, the son of the author of the "Architecture of the Heavens." The fact that the article *Alps* is by Mr. John Ball is a guarantee of its completeness and accuracy; the names and heights of all the chief peaks of the different ranges and groups are given. A most elaborate dissertation, by Prof. Turner, on *Anatomy*, occupies 109 pages of the volume, which concludes with that subject. There is an interesting biographical sketch of *Agassiz*. *Afghanistan* and *Africa* are, of course, brought up to the latest date. The treatise on *Algebra* has been revised—re-written, indeed—by Kelland; and in a recent number we alluded to Mr. Wallace's careful paper on *Acclimatisation*.

Prof. Baynes has taken the only safe method of securing articles that shall embody the fullest, and highest, and most accurate knowledge; viz., by obtaining the services of those who have proved themselves to be at the summit in their particular departments. To the present and to future generations, therefore, this ninth edition of the "Encyclopædia Britannica" must be regarded as indicating the highest tide-mark of the science, literature, and art of the time; and from this point of view the successive editions of the book are peculiarly interesting as showing the progress of knowledge during the periods that have elapsed between the times of their publication. We suspect that no edition will have required more modi-

fications to bring it abreast of the time than the present one; and, as we have said, Prof. Baynes has taken the best possible means to accomplish this purpose. In whatever other light it may be viewed, it must, when complete, be regarded as a magnificent collection of masterly treatises in every department of human learning.

This is scarcely the place, nor have we the space, to criticise the plan of the work. For mere purposes of ready reference, we suspect that less gigantic works will be found more useful. A really useful encyclopædia, one that would serve the first and chief purpose of such a work—a book of reference that may with the utmost facility be consulted at any time for information concerning any topic—should have its headings subdivided to the utmost possible limits. This will by many be considered the weak point of the "Britannica," and must be so, so long as the publishers insist on its being mainly a collection of elaborate treatises. This objection may to some extent be obviated by a thoroughly exhaustive index; but if an index is to be the chief apparatus for consulting an encyclopædia, then why not base the subdivision of the work on a logical and not on the alphabetical method?

But in view of the value of the "Britannica" as a treasury of the highest science and learning of our time, —and the publishers, we think, are justified in still retaining this as its chief characteristic—these objections may be considered as of minor importance; and of its value from this point of view there can be no manner of doubt. Prof. Baynes has already justified the choice made of him as editor, and shown himself in all respects competent to be the leader of such a splendid undertaking. We congratulate him on the success he has achieved, and wish him health and strength to carry on the work to its conclusion.

BROWN'S "MANUAL OF BOTANY"

A Manual of Botany, Anatomical and Physiological, for the use of Students. By Robert Brown, M.A., Ph.D., F.L.S., F.R.G.S. (Edinburgh: Blackwood, 1874.)

AT the present time there is a manifest want of an English text-book *au courant* with the modern state of those branches of botanical science which have to do with the minute structure, morphology, and physiology proper of plant-forms. The best that we have are often little more than introductions to the classificatory study of flowering plants. They give copious definitions and illustrations of the technical language which is needed in drawing up descriptions for the purposes of what are known as "systematic" works, but they have little to say—and that little is altogether out of date—about the important and various types which are lumped together as Cryptogams.

This state of things is obviously unsatisfactory. If the study of Biology proper is ever to make any progress amongst us, it must base its principles upon a comprehensive study of all living forms, and draw its illustrations from a wide survey of the vegetable as well as of the animal kingdom. If evolution is to be as fertile a principle in the investigation of vegetable as it has been in the case of animal development, it must take, in its own domain, as wide a scope. Lastly, if we are to turn

to any useful account the knowledge which is gradually accumulating of the part played by the simplest vegetable organisms in such phenomena as fermentation, putrefaction, and disease, a study of these and kindred organisms must play a much larger part than it has hitherto done in the botanical instruction given in the country.

Bearing in mind considerations of this kind, the publication of a new botanical text-book is a matter of considerable interest. It must, however, be at once confessed that the hopes which the admirable typography and attractive exterior of Dr. Brown's book at first sight excited have been most thoroughly dissipated by a somewhat cursory scrutiny of his pages.

The task which we feel it is absolutely necessary to undertake, of pointing out the signal badness of this book, is one of the most distasteful which anyone can assign to himself. The mere labour which is necessitated by the composition of some six hundred octavo pages of printed matter seems a sort of guarantee that the work will be in some degree genuine. And at first sight the plan which Dr. Brown has adopted is one which one cannot fail to approve. Instead of attempting, as most English manuals do, to treat the whole art and mystery of the subject in one volume, giving between the same boards a grammar of technical language, the elements of morphology, of taxonomy, of physiology proper, of distribution both in time and space, he has limited his subject in the present volume to all that concerns the higher plants alone. But the heaven cleaves to him still, and in each chapter, besides the description of the structure and functions of each several part, we have the old and tedious lists of technical terms, of which even systematic botanists trouble themselves now to use but a few.

It is, however, with respect to the detailed execution of the task that Dr. Brown has imposed upon himself that we feel obliged to speak in terms of unqualified condemnation. A book more utterly untrustworthy has probably never been issued for the use of confiding and un-instructed students; and as there is a species of singular cruelty in placing in the hands of those who have to learn stores of knowledge which, to say the least, will prove bitterly deceitful when offered as the currency of a modern examination-room, it is to be hoped that some excuse may be accepted for a degree of indignation which may seem unusual even a review.

We will simply give a few extracts from Dr. Brown's pages in order that at least our botanical readers may form their own opinion as to how far what is said above admits of justification.

Here, for example, is a description of the 'red snow plant' (*Hæmatococcus*) which will be a hopeless stumbling-block at the very outset (p. 14) :—

"Each of these plants consists of a minute globule, distinct and separate, composed of a thin membrane perfectly closed in all its parts, colourless, but containing in the interior a red liquid. By-and-by granules appear in this red liquid, which grow and soon tear the envelope, and after a time give birth to other globular vesicles exactly resembling the mother cells."

Hæmatococcus is only a form of *Protococcus*—red, instead of green. Dr. Brown's account of its life-history is behind the age altogether.

On page 16 we are told of the cell-wall: "In its ori-

ginal form the membrane is thin, transparent, and colourless with a pearly lustre." A pearly lustre (not that it exists in this case) accompanies opacity, not transparency. Nor when we have disposed of the cell-wall in this self-contradictory fashion, can it be considered an altogether adequate treatment of protoplasm to mention it incidentally amongst the liquids contained in cells as "a granular viscid substance, composed of proteine and rich in nitrogen, and surrounding the nucleus" (p. 20). It is hardly necessary to observe that the nucleus is not independent of the protoplasm, but part of it.

The account of the nucleus itself is simply apocryphal :—

"In the leaves of *Orontium japonicum* it [the nucleus] is sufficient to cause elevated markings on the epidermis, each subjacent cell having a well-marked nucleus. It can be easily seen, especially if a little iodine is applied. In that case it takes a marked brown colour, and shows distinctly that it is composed of irregularly round transparent globules, though we do not yet know whether they are really globules or little cells—solid or empty" (p. 22).

Further on (p. 23) we learn that "alcohol decolorises chlorophyll by dissolving the resinous matter,"—the fact being that alcohol dissolves the chlorophyll itself from the protoplasmic granules which it colours. On p. 25 we have the astounding suggestion that chlorophyll is derived from the nucleus "in a manner analogous to that in which starch is."

On p. 50 we learn that "vessels by their union form vascular bundles often called fibres"—a statement erroneous from beginning to end. In the account of the structure of the stem of ferns (p. 99) the masses of sclerenchyma are confounded with the fibro-vascular bundles. The account of the stem of *Lycopodiaceæ* conveys no real information at all.

The sweet galingale (*Acorus Calamus*) is called (p. 103) *Calamus aromaticus*—*Calamus* being a genus of Palms. As further instances of slovenliness which could hardly be exceeded :—

"This point [*i.e.* the growing point of the root] is called the spongeole or spongelet, from a mistaken idea of its absorbent function. It was at one time commonly taught that this [*i.e.* the growing point] was the growing and absorbing point of the root" (p. 133).

A *Euphorbia* is given as an example of *Cactaceæ* (p. 146). The whole plant of *Lemna* is alluded to as representing a leaf (p. 147).

"In *Broussonetia papyrifera*, out of the pith of which paper is made, and out of the liber of which the Polynesians weave their cloth, Duchartre notices the extreme diversity of the leaves" (p. 173). These irrelevant statements would be accurate were not the paper made from the bark and not the pith, and were not Tappa cloth a "felt" made by beating, and not a woven material at all.

Even the tedious lists of technical terms are not more accurate. The surface of the leaf, we are told (p. 205), may be "plain," to which *planum* is given as the equivalent; lower down *velvetinum* is given as the equivalent of villose.

It is sad to contemplate the fate of an unhappy examinee who should venture, trusting in Dr. Brown, to say it has been shown (p. 409) "that in many plants the pollen-tubes found at the micropyle at the time of impregnation

really originated there, and were not derived from the pollen."

Equally deplorable would be the result of affirming with Dr. Brown (p. 230) that "Turnip leaves contain 3 to 10 per cent. [of silica], oat 11 to 58 per cent. (especially in the stem), lettuce 20 per cent., oak-leaves 31 per cent., and beech-leaves 26 per cent."

It is unjust to the memory of Grew to assert that he ever disputed the discovery of the sexuality of flowering plants with Millington. Anyone who will refer to Grew's "Anatomy of Plants," p. 171, will see that he does perfect justice to Millington.

We had noted down a number of other passages equally open to criticism, but it is sincerely to be hoped in the interests of real botanical study that the specimens of this book which have been given will have some deterrent effect upon its possible readers. It is in vain that the author assures us that he has perused, for the purpose of his book, no less than 1,200 papers in almost every European language. A tithe of this literature properly selected and properly digested would have produced a manual of some value, instead of a mere chaotic dust-heap of all kinds of views belonging to all kinds of authors, as if scientific literature were in a way canonical, and the date of an author's views made no sort of difference, a common authenticity—like inspiration—embracing them all.

The blunders in the names of plants all through the book are quite as remarkable as the statements about their structure. *Chamaeparinus* (p. 101) is something more than a misprint for *Chamaecyparissus*, and it is astonishing to read about the "Brownonian" movements in a book whose author bears the honoured name of Robert Brown.

OUR BOOK SHELF

Telegraph and Travel. By Colonel Sir F. J. Goldsmid, C.B., K.C.S.I., &c. (London: Macmillan and Co., 1874.)

DURING the time of the late Bengal famine we were familiarised with seeing in the morning papers telegrams that had been despatched from Calcutta on the previous evening. Ten years ago telegraphic communication with India was but just completed *via* Constantinople, the Persian Gulf, and Karāchi: but it was some years after that before rapid through communication was arranged. The delays occurred mostly between Persia and England, and much organisation of European lines was needed before it was possible to converse with Teheran as the Shah did on his arrival at Buckingham Palace.

Those who are interested in the subject of telegraphic communication with our Indian Empire (and who is not?) will find much information in Sir F. J. Goldsmid's "Telegraph and Travel." He gives an account of the origin and development of the schemes, the troublesome diplomatic delays, and the physical difficulties that had to be overcome, as well as the arrangements that had to be made in some districts to protect the overland lines from destruction by wandering tribes. An officer of experience among Turks of Europe and Asia expressed his opinion at the outset that every convention with the Arabs in the interest of telegraph companies would be uncertain of execution, and that all wire within reach would be torn down from the poles to make heel-ropes for their horses. Instances of wilful damage unhappily were found by experience to be not rare, so that in some districts

mounted guards were needed along wide tracts, adding, of course, considerably to the working cost of the lines.

The first part of the book the author feels is likely to be "found painfully practical and matter of fact, overburdened with official details and wanting in the zest which keeps the eye willingly open and the hand steady to the book," and he pleads in excuse "the necessarily monotonous character of the subject." The accomplishment of such a communication between the two countries, however, is so momentously important an event, that the history of its progress is of interest, however it is told. Sir F. J. Goldsmid's arrangement of his materials certainly does make it rather difficult to follow the thread of the history, but then it is enlivened with many interesting little sketches, descriptions of Persian diplomatists, their manner of conducting business, and so forth.

The first part of the book is illustrated with two maps which indicate the route of the different telegraphic lines between England and India, the dates being affixed to the different sections. Sir F. J. Goldsmid writes from his own experiences and from blue-books, and gives a mass of information which could not well be compiled by anyone not practically acquainted with the work.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

Sir J. Herschel on the Endowment of Research

THE following extract from a letter from Sir John Herschel bears so directly on the distinction between the needs of theoretical and practical science insisted on in your recent leading article (vol. xi. p. 301), that I need offer no apology for communicating it. As the present value of the opinions which it expresses is intrinsic, it is unnecessary to particularise the circumstances under which the letter was written more than thirty years ago. But I may remark that it is supported by many passages in other letters in which the distinction in question, and that between research which *can* and research which *cannot* be readily effected by private means, is dwelt on (with all the scrupulous care of one than whom no responsible guardian of the public purse was ever more opposed to dependence on State aid as a principle), in a sense emphatically favourable to the demands of science for help in certain clearly indicated directions. I am sorry that I have not the papers at hand to quote from, but one instance in particular occurs to me, in which the extending and perfecting of various Physical Tables in a thoroughly satisfactory manner is declared to be altogether outside of the field of work of the individual investigator, and to be labour to be *paid for* by the community.

J. H.

Biarritz, Feb. 22

"... There is a remark which possibly it may be deemed presumptuous in me to make, relative to the general subject of scientific expenditure touched on [in your letter], but which I trust may be pardoned, as I have reason to believe my impressions on the subject are those of the whole body of British men of science, with hardly an exception. Large as the sum expended on objects officially classed as 'scientific' may appear it would not, I think, be considered as excessive if devoted to the prosecution of scientific objects in the highest and strictest sense of that word. I mean such as would be recommended for prosecution by men of science the most eminent, each in his several department, and responsible for their recommendations to the opinion of the public and of the scientific world. Under such objects I should certainly not include hydrographical, industrial, or military surveys, experiments merely technical, or many other objects, which, however indisputably necessary and